

IN THE CLAIMS:

Please amend the claims as follows:

- 1           1.     (Withdrawn) In a magnetic read head having an air bearing surface  
2           (ABS), a magnetic tunnel junction (MTJ) sensor for connection to sense  
3           circuitry for detecting changes in electrical resistance within the sensor, the  
4           sensor comprising:  
5           a MTJ stack with an active region disposed at the ABS and having two opposite sides  
6           each disposed generally orthogonally to the ABS, the MTJ stack comprising:  
7                     an antiferromagnetic (AFM) layer spanning the active region,  
8                     a pinned layer of ferromagnetic (FM) material in contact with the AFM layer,  
9                     a free layer of FM material spanning the active region and extending beyond  
10           each of the two opposite sides thereof, and  
11           a tunnel junction layer of electrically nonconductive material disposed between  
12           the pinned layer and the free layer in the active region; and  
13           a longitudinal bias layer formed on and in contact with the free layer outside of  
14           the active region for biasing the magnetic moment of the free layer in  
15           substantially a predetermined direction in the absence of an external magnetic  
16           field.
2.     (Cancelled)
3.     (Cancelled)
4.     (Cancelled)

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5. (Cancelled)

6. (Cancelled)

7. (Cancelled)

8. (Cancelled)

9. (Cancelled)

1 10. (Withdrawn) sensor of claim 1 wherein the longitudinal bias layer comprises an  
2 electrically nonconductive HM material disposed outside of the active region and in  
3 abutting contact with the two opposite sides of the active region.

1 11. (Withdrawn) A direct access storage device (DASD) comprising:  
2 a magnetic recording disk having at least one surface for storing magnetically  
3 recorded data;  
4 a magnetic read head having an air bearing surface (ABS) disposed for reading  
5 the data from the magnetic recording disk surface;  
6 in the magnetic read head, a magnetic tunnel junction (MTJ) sensor comprising:  
7 a MTJ stack with an active region disposed at the ABS and having two  
8 opposite sides each disposed generally orthogonally to the ABS, the MTJ  
9 stack comprising:  
10 an antiferromagnetic (AFM) layer spanning the active region,  
11 a pinned layer of ferromagnetic (FM) material in contact with the AFM layer,  
12 a free layer of FM material spanning the active region and extending beyond each of  
13 the two opposite sides thereof, and

14 a tunnel junction layer of electrically nonconductive material disposed between the  
15 pinned layer and the free layer in the active region; and  
16 a longitudinal bias layer formed on and in contact with the free layer outside of  
17 the active region for biasing the magnetic moment of the free layer in substantially a  
18 predetermined direction in the absence of an external magnetic field;  
19 an actuator for moving the magnetic read head across the magnetic recording  
20 disk surface to access the data stored thereon; and  
21 a data channel having sense circuitry coupled electrically to the MTJ sensor for  
22 detecting changes in resistance of the MTJ sensor caused by rotation of the magnetic  
23 moment of the free ferromagnetic layer relative to the fixed magnetic moment of the  
24 pinned layer responsive to magnetic fields representing the data stored on the magnet  
25 recording disk surface.

12. (Cancelled)

13. (Cancelled)

14. (Cancelled)

15. (Cancelled)

16. (Cancelled)

17. (Cancelled)

18. (Cancelled)

19. (Cancelled)

20. (Withdrawn) The DASD of claim 11 wherein the longitudinal bias layer comprises an electrically nonconductive AFM material disposed outside of the active region and in abutting contact with the two opposite sides of the active region.

21. (Currently Amended) In a magnetic read head having an air bearing surface (ABS), a magnetic tunnel junction (MTJ) sensor for connection to sense circuitry for detecting changes in electrical resistance within the sensor, the sensor comprising:

first and second electrically conductive leads;

a MTJ stack sandwiched between the first and second electrically conductive leads with an active region disposed at the ABS and having two opposite sides each disposed generally orthogonally to the ABS, the first and second electrically conductive leads extending laterally beyond the active region, the MTJ stack comprising:

an antiferromagnetic (AFM) layer spanning the active region,

a pinned layer of ferromagnetic (FM) material in contact with the AFM layer,

a free layer of FM material spanning the active region, and

a tunnel junction layer of electrically nonconductive material disposed between the pinned layer and the free layer in the active region; and

a nonconductive longitudinal bias layer formed outside of the active region and in abutting contact with the two opposite sides of the active region for biasing the magnetic moment of the free layer in substantially a predetermined direction in the absence of an external magnetic field, the longitudinal bias layer consisting of a layer of electrically insulating hard magnetic material extending from the first shield to the second shield.

1           22. (Currently Amended) The sensor of claim 21 wherein the nonconductive  
2 longitudinal bias layer comprises nickel-oxide [a hard magnetic (HM) material].

1           23. (Currently Amended) A direct access storage device (DASD)  
2 comprising:

3 a magnetic recording disk having at least one surface for storing magnetically  
4 recorded data;

5 a magnetic read head having an air bearing surface (ABS) disposed for reading  
6 the data from the magnetic recording disk surface;

7 in the magnetic read head, a magnetic tunnel junction (MTJ) sensor comprising:  
8 first and second electrically conductive leads;

9 a MTJ stack, sandwiched between the first and second electrically conductive  
10 leads, with an active region disposed at the ABS and having two opposite sides  
11 each disposed generally orthogonally to the ABS, the first and second  
12 electrically conductive leads extending laterally beyond the active region, the  
13 MTJ stack comprising:

14 an antiferromagnetic (AFM) layer spanning the active region,  
15 a pinned layer of ferromagnetic (FM) material in contact with the AFM layer,

16 a free layer of FM material spanning the active region, and  
17 a tunnel junction layer of electrically nonconductive material disposed between the  
18 pinned layer and the free layer in the active region; and

19 a nonconductive longitudinal bias layer formed outside of the active region and in  
20 abutting contact with the two opposite sides of the active region for biasing the  
21 magnetic moment of the free layer in substantially a predetermined direction in the  
22 absence of an external magnetic field, the longitudinal bias layer consisting of a  
23 layer of electrically insulating hard magnetic material extending from the first shield  
24 to the second shield;

25 an actuator for moving the magnetic read head across the magnetic recording  
26 disk surface to access the data stored thereon; and  
27 a data channel having sense circuitry coupled electrically to the MTJ sensor for  
28 detecting changes in resistance of the MTJ sensor caused by rotation of the  
29 magnetic moment of the free ferromagnetic layer relative to the fixed magnetic  
30 moment of the pinned layer responsive to magnetic fields representing the data  
31 stored on the magnetic recording disk surface.

1 24. (Currently Amended) The sensor of claim [23] 21 wherein the  
2 nonconductive longitudinal bias layer comprises [a hard magnetic (HM)  
3 material] barium ferrite.

25. (Cancelled)

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